DIY Kit 85_2. TIMER KIT - TWO

Note: this is Kit 85_2 from Kit 85. There has been a demand to sell the individual kits. Some references to the other kits in Kit 85 are made in the documentation below.

Timer kits are an ever popular item with the hobbyist. Two of the main methods used are a 555 IC and the discharging of an electrolytic capacitor. In this Kit we have presented three representative samples of these types of timers. There is nothing original in these circuits. Similar circuits have been presented in text books and electronics magazines for literally decades. The 555 had its own cult following back in the 1970's after it came out. Whole books of circuit designs were published using it. In the 1990's it has become a favorite chip for some people to look down on (see Don Lancasters comments about it in his columns in the American electronics magazines in the mid-1995.) But despite this it is simple to use and popular because it is so cheap and readily available.

We have placed similar input & output circuits on each of these 3 kits so the essential differences between the designs are more apparent. Input protection diodes are connected in series with the positive supply to prevent any current flow in the circuits if the power supply is connected the wrong way around. The usual diode is placed around the relay to damp the back emf from the relays coil. There is ample opportunity to experiment with these circuits to change them to suit your particular purpose. In particular we explore the 555 chip and show how it can be used quite simply to create very long duration timers.

This kit is constructed on a single-sided, routed, FR4 fibre glass printed circuit board (PCB) with a printed overlay and bottom solder mask. Protel Autotrax and Schematic were used to produce them.

ASSEMBLY INSTRUCTIONS

Check off the components against the Component listing. It is generally easiest to solder the lowest height components first - the resistors, diodes and IC sockets. Make sure you get the diodes and electrolytic capacitors around the correct way according to the overlay. Pay attention to the orientation of the hatkey switches. Make sure the flat on the switch corresponds to the flat shown on the overlay.

Three insertion sockets have been supplied so you can experiment with using different values of electrolytic capacitors. Solder these into the 3 pads at C1. Later you can replace them with a single capacitor. An extra electrolytic capacitor (the special low leakage 470uF) has been provided in this kit for experimentation as described below.

CIRCUIT DESCRIPTION

555 Differences. First a general comment about the 555 IC. It is generally stated in the text books and assumed in the magazine articles about it that all 555's are the same. And in many applications they are. But in many other applications they definitely are not, especially when you are designing near the specification limits of the IC. On top of this we have also found that there are big differences between the same type of 555 (whether nmos, or the lower power cmos version) made by different manufacturers. These problems must be kept in mind when you design using the 555. You must always prototype & test exhaustively and do not change IC brands nor nmos/cmos types without comprehensive testing. These comments also apply to the 556 IC (two 555 in the same package.) This problem of differences has not been widely reported although it is frequently alluded to in recent electronics magazine articles. (One senses the frustration reviewers have had when using different brands of 555.)

We have not attempted to review the operation of the 555 IC here. Most electronic magazines review it in detail once every few years. And it is a standard feature in most introductory electronic text books. Some magazine references are given at the end of this documentation.

Circuit Description

This kit is the traditional 555 monostable timer circuit. Pin 2 the trigger input is tied high except when the switch pulses it low to start the timer. Pin 4 the reset pin is tied high except when it the switch pulses it low to reset it. The switched output is similar to that already met in kit 85_1.

We have also changed the threshold trigger levels by attaching a voltage divider to pin 5. Normally with pin 5 just left unconnected or connected to ground via a 10nF capacitor the 555 will turn on when pin 2 is taken below 1/3 the supply voltage, and will turn off when pin 6 rises above 2/3 the supply voltage. However, by applying a voltage to this pin the comparator reference levels may be shifted either higher or lower than the nominal 1/3, 2/3 levels. We have applied about 10.8V to pin 5 in order to raise the turn off threshold higher than the usual 2/3 Vcc.

Check that the three insertion sockets have been placed in the 3 pads at C1. First push in the 100uF electrolytic capacitor. Make sure the positive lead is in the right-most socket. Set the potentiometer to mid range and press start. The LED should go on and the relay should close. Try pressing reset. The LED should go off and the relay should be released. Experiment with the potentiometer in the maximum & minimum positions and see what timing period are obtained. Next use the low leakage 470uF capacitor. What delay times do you get now?

Mains Switching

These on-board relays on these kits should not be used to switch the mains power directly. To control mains power use our Kit 84 as an interface between the timer kit and the mains power supply. Kit 84 is designed to take a zero to 12V signal, or a 12V to zero signal and switch the mains power on or off.

What to do if they do not work. Poor soldering is the most likely reason that any of the kits do not work. Check all solder joints carefully under a good light. Next check that all components are in their correct position on the PCB especially the diodes. Are the IC's in the correct way around. Did you put the link in kit 85_1.

References:

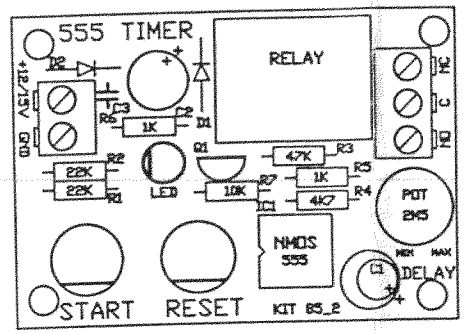
1. Design Your Own Circuits: Timers. *Everyday Electronics*, May, 1991.

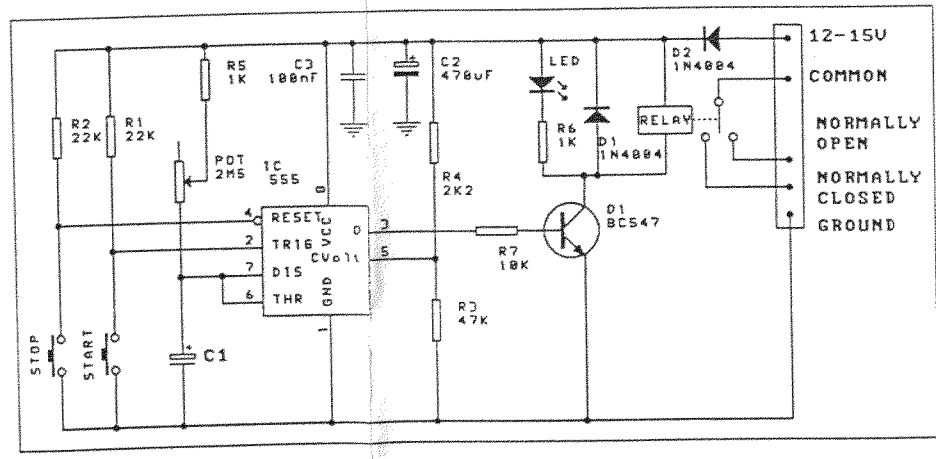
2. Timer Circuits, *Electronics Australia*, May, 1992.

3. The 555 Timer IC. *Electronics Australia*, May & June, 1996.

Components Kit 85_2

Resistors 1/4W, 5%:		
1K	R5 R6 brown black red	2
4K7	R4 yellow violet red	1
10K	R7 brown black orange	1
22K	R1 R2 red red orange	2
47K	R3 yellow violet orange	1
Piher 2M5 trimpot		1
470uF/16V LL E. cap		1
470uF/16V E. cap		1
100uF E. cap		1
100nF 104 monoblok C3		1
Hatkey switch		2
Insertion sockets		3
NE/LM555 nmos IC		1
8 pin IC socket		1
BC547 transistor		1
3mm LED		1
2 pole terminal block		1
3 pole terminal block		1
Relay		1
1N4004 diode D1 D2		2
Kit 85_2 PCB		1





Schematic K85_2